

**CLAIMS**

1           1.       A switch element comprising:  
2           a plurality of input interfaces to receive data;  
3           a plurality of output interfaces to transmit said data; and  
4           a buffer to couple to said plurality of input interfaces and to said plurality of  
5           output interfaces, the buffer including a multi-dimensional array of output queues to  
6           store said data, wherein said multi-dimensional array of output queues is shared by said  
7           plurality of output interfaces.

1           2.       The switch element of claim 1, wherein said multi-dimensional array of  
2           output queues comprise a three-dimensional array of output queues.

1           3.       The switch element of claim 2, wherein said three-dimensions comprise:

- 2           a)       a first dimension relating to a number of outputs on said switch  
3           element;  
4           b)       a second dimension relating to a number of logical paths for said data;  
5           and  
6           c)       a third dimension relating to a number of outputs from a next switch  
7           element.

1           4.       The switch element of claim 3, wherein said logical paths are assigned  
2           priority levels.

1           5.     The switch element of claim 1, wherein said multi-dimensional array of  
2     output queues share space of said buffer.

1           6.     The switch element of claim 1, further comprising a plurality of virtual  
2     input queues, wherein each virtual input queue represents a portion of said buffer.

1           7.     The switch element of claim 1, further comprising an arbiter to select  
2     data for transmission of said data to a downstream element.

1           8.     The switch element of claim 7, wherein said arbiter selects said data  
2     based on status information at said switch element.

1           9.     The switch element of claim 8, wherein a queue status monitor  
2     transmits a feedback signal from said switch element to a plurality of upstream switch  
3     elements, said feedback signal comprising status information of output queues of said  
4     switch element.

1           10.    The switch element of claim 8, wherein said arbiter selects said data by  
2     utilizing transmit pressure information.

11. A switch fabric network for transmitting data, said network comprising:  
a first switch element; and  
a second switch element coupled to said first switch element, said second  
switch element comprising:  
a plurality of input interfaces to receive data from at least said first  
switch element;  
a plurality of output interfaces to transmit said data; and  
a buffer to couple to said plurality of input interfaces and to said  
plurality of output interfaces, the buffer including a multi-dimensional array of output  
queues to store said data, wherein said multi-dimensional array of output queues is  
shared by said plurality of output interfaces.

12. The switch fabric network of claim 11, wherein said multi-dimensional  
array of output queues comprise a three-dimensional array of output queues.

13. The switch fabric network of claim 11, said second switch element  
further comprising a plurality of virtual input queues, wherein each virtual input queue  
represents a portion of said buffer.

14. The switch fabric network of claim 11, said second switch element  
further comprising an arbiter to select data for transmission of said data to a  
downstream switch element.

1           15.     The switch fabric network of claim 14, wherein said arbiter selects said  
2 data by utilizing transmit pressure information.

1           16.     A method of using a switch element in a switch fabric network, said  
2 method comprising:  
3           receiving data at an input interface of said switch element;  
4           routing said data to one of a multi-dimensional array of output queues provided  
5 within a buffer of said switch element; and  
6           outputting said data from a selected one of said output queues.

1           17.     The method of claim 16, wherein said multi-dimensional array of output  
2 queues comprise a three-dimensional arrays of output queues.

1           18.     The method of claim 17, wherein said three-dimensions comprise:  
2           a)     a dimension relating to a number of outputs on said switch element;  
3           b)     a dimension relating to a number of logical paths for said data; and  
4           c)     a dimension relating to a number of outputs from a next switch element.

1           19.     The method of claim 16, wherein said switch element comprises a  
2 plurality of virtual input queues, wherein each virtual input queue represents a portion  
3 of said buffer.

1           20.     The method of claim 16, further comprising selecting said data in one of  
2     said output queues prior to said outputting.

1           21.     The method of claim 20, wherein said data is selected based on status  
2     information at said switch element.

1           22.     The method of claim 20, wherein said data is selected by utilizing  
2     transmit pressure information.

1           23.     The method of claim 16, further comprising transmitting a feedback  
2     signal from said switch element to a plurality of upstream switch elements, said  
3     feedback signal comprising status information of output queues of said switch element.

1           24.     A switch element comprising:  
2             a buffer including a multi-dimensional array of output queues to store data; and  
3             an arbiter to select one of said output queues for transmission of data, and a  
4     queue status monitor to track the statuses of said multi-dimensional array of said  
5     output queues.

1           25.     The switch element of claim 24, wherein said arbiter selects said one of  
2     said output queues based on information of said switch element and information of a  
3     next switch element.

1           26.     The switch element of claim 25, wherein said arbiter further selects said  
2     one of said output queues based on transmit pressure information.

1           27.     The switch element of claim 24, wherein said multi-dimensional array of  
2     output queues comprises three-dimensional output queues.

1           28.     The switch element of claim 27, wherein said three-dimensions  
2     comprise:

3           a)     a first dimension relating to a number of outputs on said switch  
4     element;

5           b)     a second dimension relating to a number of logical paths; and

6           c)     a third dimension relating to a number of outputs from a next switch  
7     element.

1           29.     The switch element of claim 24, further comprising a plurality of virtual  
2     input queues, wherein each virtual input queue represents a portion of said buffer.

1           30.    The switch element of claim 24, wherein said arbiter selects said one of  
2   said output queues based on status information at said switch element.

1           31.    The switch element of claim 24, wherein said queue status monitor  
2   transmits a feedback signal from said switch element to a plurality of upstream switch  
3   elements, said feedback signal comprising status information of output queues of said  
4   switch element.

1           32.    A method of communicating information in a switch element, said  
2   method comprising:  
3       receiving data at said switch element;  
4       storing said data in one queue of a multi-dimensional array of output queues in  
5   a buffer of said switch element; and  
6       selecting one of said output queues for transmission of data.

1           33.    The method of claim 32, wherein selecting said one of said output  
2   queues comprises selecting based on information of said switch element and  
3   information of a next switch element.

1           34.    The method of claim 33, wherein said selecting is further based on  
2   transmit pressure information.

1           35.    The method of claim 32, wherein said multi-dimensional array of output  
2 queues comprises a three-dimensional array of output queues.

1           36.    The method of claim 35, wherein said three-dimensions comprise:  
2           a)    a first dimension relating to a number of outputs on said switch  
3 element;  
4           b)    a second dimension relating to a number of logical paths for said data;  
5 and  
6           c)    a third dimension relating to a number of outputs from a next switch  
7 element.

1           37.    The method of claim 32, wherein said switch element includes a  
2 plurality of virtual input queues, wherein each virtual input queue represents a portion  
3 of said buffer.

1           38.    The method of claim 32, further comprising transmitting a feedback  
2 signal from said switch element to a plurality of upstream switch elements, said  
3 feedback signal comprising status information of output queues of said switch element.

1           39.    A switch comprising:  
2           a first output interface associated with a first output link;  
3           a first queue associated with said first output interface; and



4 a first arbiter associated with said first output interface and said first queue,  
5 wherein said first arbiter schedules a next data packet for transmission from said first  
6 output interface based on one of a pressure function and a local path priority.

1 40. The switch of claim 39, wherein said first arbiter schedules said next data  
2 packet for transmission from said first output interface based on both said pressure  
3 function and said local path priority.

1 41. The switch of claim 40, wherein said first arbiter schedules said next data  
2 packet based on calculated transmit priorities of target queues in a downstream switch.

1 42. The switch of claim 41, wherein said first arbiter schedules said next data  
2 packet relating to a target queue having a highest calculated transmit priority.

1 43. The switch of claim 39, further comprising a second output interface  
2 associated with a second output link, a second output queue associated with said  
3 second output interface, and a second arbiter to schedule a next data packet for  
4 transmission from said second output interface.

1 44. The switch of claim 39, wherein said pressure function relates to a  
2 relationship of data in said switch and data in a downstream switch.

1 45. A method of scheduling data traffic from a switch, said method  
2 comprising:  
3 determining a transmit priority based on one of a pressure function and a local  
4 path priority; and  
5 scheduling data traffic based on said determined transmit priority.

1 46. The method of claim 45, wherein said determining is based on both said  
2 pressure function and said local path priority.

1 47. The method of claim 45, wherein transmit priority is further determined  
2 based on information of target queues in a downstream switch.

1 48. The method of claim 47, wherein said scheduling comprises selecting a  
2 target queue of said downstream switch having a highest calculated transmit priority.

1 49. The method of claim 45, wherein said pressure function relates to a  
2 relationship of data in said switch and data in a downstream switch.